

REMARKS

Status of the Claims

Claims 1, 3-4 and 9-22 are pending. Claims 11-20 have been withdrawn from consideration.

In the present Amendment, claims 5, 7 and 8 have been canceled herein without prejudice or disclaimer of the subject matter contained therein. Claims 2 and 6 were previously canceled. Also, claims 1 and 21 have been amended, and claim 22 has been added.

Support for the amendment to claim 1 can be found in original claim 7. Support for the amendment to claim 21 can be found in original claim 5. Support for new claim 22 can be found in claims 1, 2, 5, 7 and 8. No new matter has been added with these changes.

Reconsideration of this application, as amended, is respectfully requested.

Reasons for Entry of Amendments

At the outset, it is respectfully requested that this Amendment be entered into the Official File in view of the fact that the amendments to the claims automatically place the application in condition for allowance.

In the alternative, if the Examiner does not agree that this application is in condition for allowance, it is respectfully requested that this Amendment be entered for the purpose of appeal. Applicants note that though claim 22 has been added, claims 5, 7 and 8 have been canceled. Thus, there are less claims pending after entry of the present Amendment. Also, claim 22 is a combination of previously considered claims 1, 2, 5, 7 and 8.

Drawings

Since no objection has been received, Applicants assume that the drawings are acceptable and that no further action is necessary. Confirmation thereof in the next Office Action is respectfully requested.

Rejections under 35 U.S.C. § 103(a)

Claims 1, 3-5, 7-10 and 21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over **Oh '866** (U.S. 2003/0018866) in view of **Zhou** (*Advanced Functional Materials 2001*) and **van Duren** (*Advanced Functional Materials 2002*). This is a new rejection.

Applicants respectfully traverse. Reconsideration and withdrawal of this rejection is respectfully requested.

A complete discussion of the Examiner's rejection is set forth in the Office Action, and is not being repeated herein.

The Present Invention

The objects of the present invention include the suppression of leak current of the organic EL element while improving the conductivity of the organic EL element and suppressing the operation voltage. In particular, suppression of the leak current of the organic EL element is attained by the hole injection layer having a border region with a reduced acceptor concentration formed in the vicinity of an interface between the hole injection layer and the positive electrode, or the hole injection layer having a border region with a reduced acceptor concentration formed in the vicinity of an interface between the hole injection layer

and the hole transport layer. As recited in pending claims 1, 21 and 22, the conductivity of the hole injection layer continuously changes along a thickness direction of the hole injection layer (a feature not disclosed by the primary reference), wherein the hole injector layer has a border region with a reduced acceptor concentration formed in the vicinity of an interface between the hole injection layer and the positive electrode and the acceptor concentration in the hole injection layer changes by at least 10% in the vicinity of the interface(s).

The Graham Factors and Improper Combination of References

The obviousness inquiry is decided as a matter of law, based on four general factual inquiries as explained in *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966), and reaffirmed in *KSR Int'l, Inc. v. Teleflex, Inc.*, 550 U.S. 398, 406–07 (2007). Here, those *Graham* factors weigh in Applicants' favor, and a proper rationale has been used to reject the disputed claims. Regarding the *Graham* factor of ascertaining the differences between the prior art and the claims at issue, Applicants submit the change in acceptor concentration is not disclosed in any of the cited references.

The cited primary reference of Oh '866 fails to disclose the instantly recited electron injecting layer adjacent to the cathode (negative electrode) side of the organic emitting layer (luminescent layer) as well as the conductivity of the hole injection layer (HIL) continuously changing along a thickness direction of the HIL as recited in the pending claims. Again, each independent claim recites that the conductivity of the hole injection layer continuously changes along the thickness direction of the hole injection layer.

The secondary reference of Zhou completely fails to mention a leak current by controlling a border region with a reduced acceptor concentration as instantly claimed.

Also, both Oh '866 and Zhou fail to disclose the reduced acceptor concentration, as well as and the acceptor concentration in the hole injection layer changing by at least 10% in the vicinity of the interface, as instantly claimed.

The cited van Duren does not account for the noted deficiencies of the two other references.

Regarding the cited secondary reference of van Duren, the Examiner asserts that the effective concentration of the acceptor in the border region would be reduced in comparison to the acceptor concentration in regions of the HIL further away from the border region since the interfacial contains an additional component (indium) (Office Action, page 5). However, the volume of the acceptor (an organic compound) should be much greater than the volume of the indium. Therefore, in van Duren, the additional component having a small volume could not affect the concentration of the acceptor in the border region by "at least 10%" as recited in the presently pending claims. Thus, all three references, even when combined, fail to disclose the instantly claimed reduced acceptor concentration. In this regard, and as the M.P.E.P. directs, all claim limitations must be considered in view of the cited prior art in order to establish a *prima facie* case of obviousness. *See* M.P.E.P. § 2143.03. Withdrawal of the rejection is respectfully requested.

Claims 1 and 21 as shown herein as well as new claim 22 define a reduced concentration of "at least 10%". On the other hand, as explained above, the cited references do not teach the above reduced concentration whatsoever. Also, combining known prior art elements is not

sufficient to render the claimed invention obvious if the results would not have been predictable to one of ordinary skill in the art. *United States v. Adams*, 383 U.S. 39, 51-52, 148 USPQ 479, 483-84 (1966); *see also* M.P.E.P. § 2143. The three references have been improperly combined.

Further, the Examiner alleges that Applicants have not pointed to any special method to position the acceptor with a reduced concentration in a given border region. However, the present specification clearly discloses how to position the acceptor with a reduced concentration in a given border region, as shown in Example 3 (at pages 12-14). That is, a deposition method that controls a deposition speed is used. In contrast, the van Duren reference uses a spin coating method which causes diffusion of components. The deposition method of the present invention does not cause diffusion of components.

Regarding the evaluation of evidence of secondary considerations (e.g., unexpected results), *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966), Applicants note the unexpected, superior results achieved by the present invention (i.e., EXAMPLES 1-3; see Fig. 5, which is also discussed on page 14 of the specification) versus an embodiment wherein the conductivity of the hole injection layer is uniform along a thickness direction of the hole injection layer (i.e., COMPARATIVE EXAMPLE). The present invention has improved suppression of leak current while maintaining luminous intensity, operation voltage, and luminous efficiency. Applicants note that the primary reference does not even disclose the claimed conductivity of the hole injection layer continuously changing along a thickness direction of the hole injection layer. This comparative example is like the cited references. Thus, the three inventive EXAMPLES can be properly compared to the COMPARATIVE EXAMPLE.

Still, the Examiner at page 10 of the Office Action states that Applicants have not included any limitation with respect to suppression leak current. However, Applicants note that reciting such an achieved property is not needed. As stated in the decision of *In re Merchant*, 197 U.S.P.Q. 785, 788 (C.C.P.A. 1978), concerning objective evidence:

Finally, the solicitor repeats the objection voiced by the examiner that the declaration is irrelevant because the claims specify neither the unexpected result nor the “features” that produce that result. *We are aware of no law requiring that unexpected results relied upon for patentability be recited in the claims.* The “features” referred to by the examiner are the conditions of pressure, feed rate, and reactor retention time for the commercial operation described in the declaration. We are equally unaware of any law requiring that commercial production parameters be claimed. Moreover, the “feature” responsible for appellant’s unexpected results is recited in the claims, viz., “substantially anhydrous.”

(Applicants’ emphasis added.) Thus, reconsideration of the experimental evidence in light of the new rejection is respectfully requested.

In consideration of the above, it would not be obvious for one of ordinary skill in the art to conceive of the present invention from the disclosures in Oh ‘866, Zhou and van Duren. Further, the references are improperly combined and the *Graham* factors weigh in Applicants’ favor. Reconsideration and withdrawal of this rejection are respectfully requested.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and

complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

In view of the above amendment, Applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez, Registration No. 48,501, at the telephone number of the undersigned below to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Director is hereby authorized in this, concurrent, and future replies to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

Dated: January 5, 2011 Respectfully submitted,

By 
MaryAnne Armstrong, PhD
Registration No.: 40069
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road, Suite 100 East
P.O. Box 747
Falls Church, VA 22040-0747
703-205-8000